

Indirect sources of mercury poisoning in the Iraqi epidemic*

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Secondary sources of intoxication with methylmercury poisoning other than home-made bread were explored. Mercury levels in various food items were below 0.05 mg/kg.

Over 30 000 specimens of meat and internal organs of sheep were analysed because of the strong suspicion that the animals had been fed treated barley. It was found that 6-12% of the specimens analysed contained more than 0.5 mg/kg of mercury. Consumption of meat did not appear to constitute a danger of intoxication during the outbreak.

INTRODUCTION

In the 1972 outbreak of mercury poisoning in Iraq the main cause of intoxication in adults was the consumption of home-made bread baked from wheat treated with methylmercury. Transplacental passage and breast feeding by exposed mothers were other routes of intoxication in humans.¹

Meat, eggs, and milk from animals (including chickens) that had been fed treated grain were possible secondary sources of mercury poisoning. This study was conducted to search for any possibility that intoxication from these sources might have contributed to the epidemic.

The background level of mercury in foodstuffs has been reported from different countries such as Canada, Japan, and the USA,^{2,3} but such background values are not available for Iraq or neighbouring countries.

MATERIAL

From February to May 1972 samples were collected from slaughterhouses. One animal was arbitrarily chosen from each 10 slaughtered, and meat, kidney and liver samples were taken for mercury analysis. Concurrently with this programme, a nationwide survey was conducted to collect biopsy samples from the sheep population of the country. The biopsy samples were collected at a rate of 1 sample per 100 sheep. Altogether over 30 000 samples of meat were analysed. Random samples were also collected of chicken, eggs, fish, milk, and game birds throughout the country.

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METHODS OF ANALYSIS

Both neutron activation analysis and flameless atomic absorption methods were used.

RESULTS

Sampling of food items, other than meat, was random; numbers were adequate, but the sampling was not done as systematically as for meat analysis. Mercury levels were found to be within normal and acceptable limits in vegetables, rice, fruit, chicken, eggs, milk, and fish.

In a few seed-eating and insect-eating birds the mercury level was high, but the birds concerned were all captured in the vicinity of storehouses where there were treated seeds (see page 116).

Meat was the main item of this study; Table 1 shows the sheep population in each province, the number of samples analysed, and the amount of barley distributed compared with the amount used for planting.

TABLE 1. GEOGRAPHICAL DISTRIBUTION OF SHEEP AND BARLEY IN IRAQ, BY PROVINCE, WITH DETAILS OF ANALYSES OF SAMPLES FROM SHEEP

Province	No. of sheep (thousands)	No. of samples analysed	Samples containing >0.5 mg/kg No.	%	Barley distributed (tons)	Barley planted (tons)
Baghdad	989	13 091	569	4.3	377	347
Nineveh	1 735	1 976	239	12.1	9 102	5 370
Basra	186	380	35	9.2	10	8
Maysan	576	816	31	3.8	699	546
Thi-Qar	2 149	817	35	4.9	382	363
Qadisiya	930	1 482	38	2.6	715	542
Babylon	569	925	55	5.9	1 095	876
Kerbela	321	374	11	2.9	25	23
Anbar	777	729	86	11.8	224	184
Diyala	640	2 094	107	5.1	962	760
Arbil	956	1 719	70	4.1	1 538	1 180
Kirkuk	1 142	3 890	465	12.0	4 392	2 640
Sulaimaniya	530	496	27	5.4	42	42
Wasit	799	518	29	3.9	511	491
Muthanna	277	395	39	9.9	1 665	266
D'hok	73	333	18	5.4	523	162

The specimens of meat that contained more than 0.5 mg/kg of mercury varied between 2.6% and 12.1% of the samples analysed.

In most provinces less than 6% of the specimens exceeded 0.5 mg/kg; however Nineveh, Anbar, Muthanna, and Kirkuk were exceptions and 10-12% of the samples from these provinces showed high values.^a The death rate in sheep suspected to have been fed treated seed, and then put under surveillance, was 0.4% during the outbreak.

^a Nineveh, 12.1 mg/kg; Kirkuk, 12.0 mg/kg; Anbar, 11.8 mg/kg; Muthanna, 9.9 mg/kg.

The result of analyses in an average province showed that only 71% of the kidney samples contained less than 0.05 mg/kg, whereas 81% of the meat samples contained less than 0.05 mg/kg. The majority of the rest had levels of 0.1-0.5 mg/kg and less than 5% of the total specimens examined contained more than 0.5 mg/kg.

The percentages of meat and kidney specimens containing more than 0.05 mg/kg of mercury decreased progressively during the observation period, as shown by repeated analyses carried out from February to March 1972. In February, the peak of the outbreak, 14% of the meat and 35% of the kidney specimens had levels higher than the basic level of 0.05 mg/kg. These percentages fell to 4% and 12% respectively in April and remained the same during May.

DISCUSSION

Although there was no authenticated case of methylmercury poisoning induced by sources other than by direct consumption of home-made bread, by intrauterine exposure or through lactation by exposed mothers, it was nevertheless important to explore other possible routes. A major concern was the difference between the amount of treated seed distributed and that actually used for planting. Some seed was used for animal feed and some was dumped into rivers. Although fish is not a regular food item in Iraq, analyses were made because it was thought that the mercury level in fish might have been high owing to the dumping of treated seed in streams. In fact the analyses showed figures less than 0.5 mg/kg in river fish and fish from the Gulf area. Similar levels were found in fish caught near a soda plant south of Baghdad where some mercury gets into the river.

The high level of mercury in a few seed-eating and insect-eating birds was never a hazard since it was found only in birds captured near storehouses where there was treated seed, and a high level in such birds was to be expected.

The mercury levels in eggs and chickens, which are regularly eaten in Iraq, did not exceed the permissible level. Moreover the major portion of these two food items have in the last few years been imported from foreign countries.

The most important dietary item, next to bread and rice, is meat (chiefly mutton), which is a daily part of the diet in average middle- and high-class families. During the peak of the outbreak 6% of the specimens analysed contained more than 0.5 mg/kg of mercury except in the 4 provinces of Nineveh, Kirkuk, Muthanna, and Anbar, where levels exceeding 0.5 mg/kg were found in 10-12%. One reason for this is that more seed was distributed than was planted; the other reason is that good grazing was scarce that year and therefore some farmers used the treated seed for animal feed.

An average Iraqi family of 5 or 6 persons consumes about 0.5 kg of meat daily. The highest mercury level found in meat was a few mg per kg. Even if all animals had had such a level this would have resulted in a daily intake of less than 0.5 mg per person per day. In fact, less than 5% of animals contained such a level at the peak of the outbreak, which explains why there was not a single known case of intoxication caused by meat consumption.

Since the consumption of treated seed had stopped by February, the percentage of animals having mercury levels greater than 0.05 mg/kg declined sharply during March and April to only 4%, which seems to be normal for Iraq. This was to be expected since the half-life of methylmercury in sheep is only a couple of weeks.⁴

On the basis of these findings the authorities were advised to close the slaughterhouses in the provinces of Kirkuk, Muthanna, Nineveh, and Anbar from February until the middle of March. These were the provinces where more than 4% of the specimens contained mercury values higher than 0.5 mg/kg.

Kidney and liver were not allowed for human consumption. As a further precautionary measure, only lambs (3 months old) were permitted for human consumption; the reason is that they are nursed until this age, and sheep milk contained no significant amount of mercury.

This study seems to confirm the finding from clinical observations and the available data that no authenticated case of poisoning occurred that could be traced to sources other than home-made bread, intrauterine poisoning, and breast feeding by poisoned mothers.

RESUME

SOURCES INDIRECTES D'INTOXICATION PAR LE MERCURE EN IRAK

On a étudié les sources secondaires d'intoxication méthylmercurielle autres que le pain de ménage. Les concentrations de mercure observées dans divers aliments ont été inférieures à 0,05 mg/kg.

Plus de 30 000 spécimens de viande et d'organes internes de moutons dont on avait de fortes raisons de croire qu'ils avaient mangé de l'orge traitée ont été analysés. On a constaté que de 6 à 12% des spécimens analysés contenaient plus de 0,5 mg de mercure par kg. Il ne semble pas qu'au moment de l'épisode étudié la consommation de viande ait pu entraîner un danger d'intoxication.

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